

# Alerts, Notices, and Case Reports

## Measles Outbreak at a University Without a Two-Dose Immunization Requirement

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THE INTRODUCTION OF live measles vaccine in 1963 led to a dramatic decline in the incidence of measles in the United States. A single-dose schedule, however, failed to adequately control measles outbreaks among school-aged children and college students. In 1989 a two-dose policy was recommended, but it has yet to be fully implemented, and sporadic outbreaks continue to occur. Substantial costs are associated with outbreak control strategies as efforts are made to prevent the morbidity and occasional fatality of measles disease.

Colleges and universities present particular challenges to the control of measles. It is estimated that 14.4 million students attend 3,600 institutions of higher education each year. Student populations are a heterogeneous mix of people with varying origins and immunization histories. Students live and attend classes in close proximity to one another, facilitating the transmission of communicable diseases. They are also mobile and tend to engage in frequent domestic and foreign travel where infectious diseases may be acquired and brought back to the college campus and potentially the surrounding community. During 1980 to 1991, the Centers for Disease Control and Prevention (CDC) received reports of 3,919 cases of measles at colleges, ranging from 0.6% to 19.8% of the total measles cases reported to the CDC.<sup>1</sup>

We report here a measles outbreak at a university in 1995 that resulted in substantial financial cost and disrupted campus activities and community events. It was successfully contained so that it resulted in relatively few cases and was confined to the university campus community.

### Background

Western Washington University (WWU) is located in Bellingham, a city of 58,000 in rural Whatcom County on the north coast of Washington State. There were 10,284 students attending classes on campus in 1995. Beginning with the academic year 1989-1990, one dose of measles, mumps, and rubella vaccine (MMR) was required of incoming students, and they were asked to record the dates of immunizations on their health history form. Without active enforcement, school officials estimate that about 60% of students had documentation of immunization at the time of the outbreak. There were no immunization requirements for faculty and staff.

On February 14, 1995, Whatcom County health officials were notified by Washington State health officials of a possible measles case in a 21-year-old student at WWU who was a resident of another county. Records of the WWU Student Health Center showed that she had been seen in the clinic on February 9 with a febrile rash illness. Although no immunizations had been recorded on the student's health history form, and a blood specimen was drawn for rubeola titer, the student said that she had been vaccinated and measles was not thought likely. The student went to her parent's home in another county, and her continued illness was recognized as probable measles by a public health nurse at the local health department. Serum specimens from both February 9 and February 14 were positive for rubeola IgM antibody.

### Methods

#### Case Definition

A clinical case of measles was defined as an illness that met the CDC clinical case definition: generalized maculopapular rash of three days' duration or longer; fever ( $\geq 38.3^{\circ}\text{C}$  [ $101^{\circ}\text{F}$ ]) if the temperature is measured; and cough, coryza, or conjunctivitis. A confirmed case met the clinical case definition and was either confirmed by serologic test or was epidemiologically linked to another measles case.

#### Case Ascertainment and Surveillance

Press releases to campus and community newspapers and radio stations and class announcements informed students and community members about the outbreak. Licensed child care providers, including the child care center on the WWU campus, and Whatcom County school officials were specifically notified.

Primary care physicians were alerted by the county health department to report any symptomatic patients. All reports of febrile rash illnesses by the student health center, private physicians, and individuals were investigated by county public health nurses. Serum, urine, and

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**ABBREVIATIONS USED IN TEXT**

CDC = Centers for Disease Control and Prevention  
MCV = measles-containing vaccine  
MMR = measles, mumps, and rubella vaccine  
PIR = prematriculation immunization requirement  
WWU = Western Washington University

nasopharyngeal specimens were collected and sent to the state laboratory and to the CDC. Patients with prodromal symptoms were monitored for five days by phone for the appearance of a rash.

A total of 250 students from 22 colleges and universities in the western United States and Canada had attended a conference at WWU the previous week. Many of the students, along with 60 short-term students from Japan, had stayed in the same dormitory as the WWU student who had the first identified measles case. The Washington State Department of Health and the CDC assisted with follow-up of these possible exposures through county and state health departments and international health officials.

**Outbreak Control**

An immunization clinic was held the day after the case report in the residence hall of the reported case. Two more measles cases were identified, and on February 16, a campus-wide immunization campaign was instituted. All students born after January 1, 1957, without documented proof of two doses of measles-containing vaccine (MCV) after their first birthday, documentation of previous physician-diagnosed measles, or serologic evidence of immunity were required to be vaccinated with MMR.

To ensure compliance, computerized records were kept on those students who had fulfilled the proof of immunity or vaccination requirement and were thus "cleared" for routine campus activities. By February 24, class instructors were required to exclude from attendance any student who was not cleared. Recommendations were made to university faculty and staff that they be vaccinated if they were born after January 1, 1957, and had not had two doses of MCV.

On-campus activities that potentially involved a substantial number of nonstudents from the community were evaluated on an individual basis. Many events were canceled. Others were restricted to people born before 1957 and those with an "Events Clearance Card." Such cards were valid 11 days after the bearer had received a documented second dose of MCV.

**Costs Determination**

University officials were asked to report direct costs for materials and personnel overtime paid due to the outbreak and to estimate the loss of revenue from canceled events. Health officials from the county and state health departments also reported costs incurred due to the outbreak.

**Results**

Eleven cases of measles were confirmed, all within the campus community. Ten cases were in students aged 19 to 22 years, and one was in a 42-year-old female food service worker in one of the residence halls. None of the patients was admitted to the hospital. The index case was identified as a 20-year-old female student who had spent the winter break in a California county where there was a widespread community outbreak of measles. She returned to campus and became ill four weeks before the first case was reported. Measles developed in four of five household contacts of the index case.

Seven of the ten students with measles had recorded dates of a single dose of MCV after their first birthday on their WWU health history form. The 42-year-old food service worker and three of the affected students had no recorded dates of having received MCV. On further investigation, the index patient and two of her household contacts, all IgM-positive for rubeola, were found to have each received two doses of MCV.

Other than the five cases from one household, no direct contact between patients could be determined beyond their presence on the campus. Although six persons with confirmed measles lived off campus, measles cases were found only in people who attended classes or worked at the university. There were no reported cases of measles in other community residents or in any of the students who had visited the campus early in the outbreak from other states or countries.

Investigations of 86 reports of febrile rash illnesses on campus and in the community revealed several other viral causes. Specimens collected from 67 patients identified 15 cases of influenza A (H3N2), 1 of parainfluenza, 1 of adenovirus and, 1 of respiratory syncytial virus infection.

Campus immunization clinics administered 8,278 doses of MMR. By 14 days from the initial measles case report, 94.8% of students had two documented doses or at least one recent dose of MCV. No measles cases occurred after the conclusion of the immunization campaign (Figure 1). The outbreak was declared concluded four weeks after the first case report.

The county health department reported \$44,523 in personnel costs for the outbreak, \$1,949 in supplies, and \$5,346 in lost revenue due to the cancellation of other department activities. The state department of health reported \$4,933 in personnel costs, \$3,474 for travel, \$39,206 for laboratory services, and \$135,435 for materials including the cost of vaccine.

The university reported direct costs of the outbreak at \$24,810 paid in overtime wages and for materials. Further loss of revenue was estimated at \$38,500 due to the cancellation of events including sports events, theatrical productions, concerts, and conferences. The total estimated costs related to this outbreak were \$298,176. Cost estimates did not include the thousands of volunteer and overtime hours contributed by faculty, staff, and students or the loss of work time by many university staff who were occupied by the management of the outbreak.

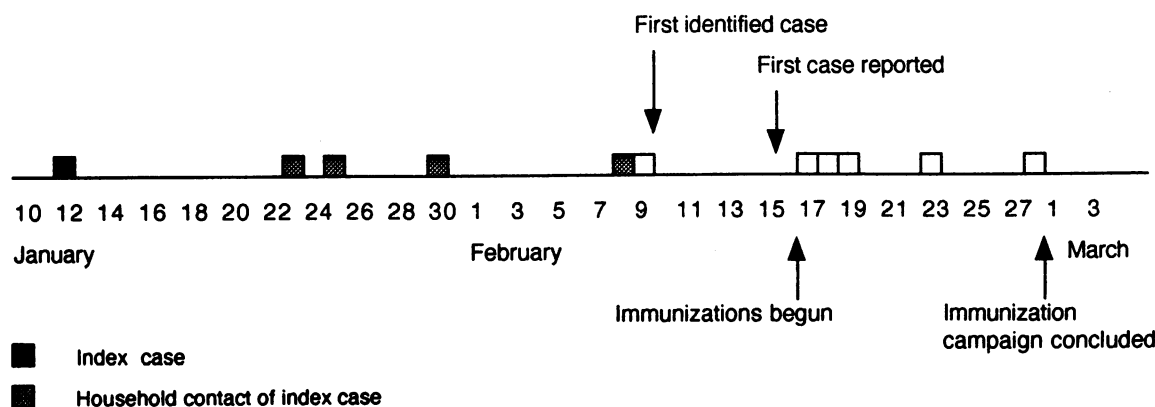


Figure 1.—Measles cases by dates of rash onset, Western Washington University, Bellingham, 1995.

## Discussion

In 1980 the CDC's Advisory Committee on Immunization Practices recommended for the first time that all college applicants be required to show proof of immunity to measles before matriculating,<sup>2</sup> and this position was adopted by the American College Health Association in 1983.<sup>3</sup> This prematriculation immunization requirement (PIR) has been implemented slowly by institutions, state health departments, and legislatures.

During 1987 to 1990, Hutchins and co-workers reported that the United States had a sixfold to ninefold increase in reported measles cases over the annual mean of 3,000 cases seen in the mid 1980s.<sup>4</sup> One high-incidence group was persons older than 18 years, both vaccinated and unvaccinated, who were past school age. This group accounted for 22% of the cases. Of a total of 11 large outbreaks in this age group, 7 (64%) occurred on college campuses, and college students accounted for most of the cases of outbreaks in the group past school age.

In 1989, the Advisory Committee on Immunization Practices and the American College Health Association recommended that colleges and universities extend their immunization requirements to two doses of measles vaccine received on or after 1 year of age.<sup>5</sup> The two-dose measles PIR has been adopted by fewer than 30 states, and campus outbreaks of measles have continued to occur, for example in Texas (1991, 44 cases), Mississippi (1992, 15 cases), and New Jersey (1994, 94 cases) (CDC, unpublished data, February, 1996).

Baughman and colleagues concluded that colleges and universities in states mandating a two-dose measles PIR were three times less likely to have measles outbreaks compared with institutions with either an institutional PIR that was not enforced or no PIR at all.<sup>1</sup> The WWU outbreak seems to illustrate this because only one dose of MMR was required of incoming students, and there was no active enforcement of this policy.

Many institutions are reluctant to develop effective enforcement mechanisms for PIRs, such as a hold on

registration for noncompliance. But enforcing PIRs might help to prevent outbreaks, would result in much less campus disruption, and would reduce the cost of outbreak control should a measles case occur. Birkhead and associates, reporting on a measles outbreak in a college setting, estimated monetary costs similar to those we report.<sup>6</sup> When cases extend into surrounding communities, routine activities are disrupted and financial costs rise significantly.

The aggressive immunization campaign at WWU may have been effective in preventing further spread of the outbreak even though measles cases were not identified until the third generation of transmission. The delay in recognizing the outbreak may have been related to widespread partial immunity resulting in mild or atypical illness. Other febrile illnesses, many with rashes, further complicated the outbreak investigation. We were able to identify specific viral pathogens in the absence of rubeola in 18 of 67 (28%) of patients with a rash illness from whom specimens were collected.

It has been estimated that a vaccination level of 94% to 97% is needed to interrupt measles transmission and prevent outbreaks.<sup>7</sup> Only one case occurred after this level of immunization had been achieved in the WWU student population, and this was in a food service worker born before 1957 who had not received any MCV. It is interesting to note that three of the initial patients in the same household had histories of receiving two doses of MCV. They had received their first doses before 1979, when a new stabilizer was added to the vaccine, but we cannot further explain this cluster of vaccine failures in a household exposure to measles.

Since the outbreak, WWU has required the documentation of two doses of MCV or documented evidence of immunity to measles before registration. Information is given to students about other vaccine-preventable diseases, and hepatitis B vaccine is offered at a low cost. Due to the differing epidemiology and control strategies involved, immunization against diseases other than

measles is not required for matriculation. Students requesting religious, philosophical, or medical exemption are informed that they may be excluded from classes and other campus activities in the event of a measles outbreak. With current policies and enforcement procedures in place, a vaccination level of more than 95% can be maintained and future outbreaks prevented or limited.

If such policies were widely adopted, college students might be eliminated as an important source of measles transmission. This would contribute to the support of global measles eradication recently explored by the World Health Organization, the Pan American Health Organization, and the CDC.<sup>8</sup> In that report the participants concluded:

Preventing measles outbreaks is more effective than trying to contain them. Mass vaccination campaigns undertaken in response to outbreaks are of limited usefulness . . . because such efforts are costly, disruptive, and often ineffective by the time they are instituted.<sup>8(p17)</sup>

We concur with this statement.

With the recent agreement by the CDC's immunization committee and the American Academy of Pediatrics' Committee on Infectious Diseases to recommend a second dose of measles vaccine any time longer than one month after the first, a recent editorial points out that the question of the optimal timing for the second dose may become moot as the goal of measles eradication is attained in the 21st century.<sup>9</sup> In the meantime, although measles outbreaks are still a possibility, we support the use of PIRs to help prevent them and to lessen the costly effects of measles outbreaks in a college setting.

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## 'Virtual' Factitious Disorders and Munchausen by Proxy

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FACTITIOUS DISORDERS involve the feigning or self-induction of ailments, physical, emotional, or both, in the service of assuming the "sick role."<sup>1</sup> The form factitious disorders have taken, from simulated seizures to self-induced infections, are limited only by human creativity.<sup>2</sup> In Munchausen by proxy, also called "factitious disorder by proxy," persons may demonstrate equal ingenuity in falsifying or creating illness in others, the goal being to assume the sick role vicariously.<sup>3</sup>

The manner in which false illness is communicated is apparently relatively unconstrained as well. With the exponential increase in the number of people with internet access, "virtual" support groups have multiplied. Many of them, conducted by e-mail or internet postings and sometimes requiring a free subscription, have been established for persons with particular diseases. Typically, the members of such networks strongly support one another, communicating not only information but strong emotion founded on their personal battles with illness. It is now emerging, however, that these groups simultaneously provide an inexpensive, convenient, and readily accessible forum for people who choose to misrepresent themselves as ill. As far as we know, the cases that follow are the first to be reported in which persons have exploited the internet as their "highway" to patienthood.

### Report of Cases

#### Patient 1

A participant in an e-mail support group for persons with cancer and their loved ones posed as an ordained monk in the Catholic Church. He claimed to have a rare, quickly progressing form of cancer and further asserted that, because of his vow of poverty and the constraints of monastic life, he was unable to seek treatment of his disease. He requested the assistance of the support group in dealing with his loneliness and his fears about dying. At one point, he discussed a visiting nurse who had begun to assist him in his daily activities. Over time, the energy

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